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*L. L. Hourani
H. Yuan
R. M. Bray
A. M. Vincus*

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NAVAL HEALTH RESEARCH CENTER
P. O. BOX 85122
SAN DIEGO, CALIFORNIA 92186 - 5122

NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND
BETHESDA, MARYLAND



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**PSYCHOSOCIAL CORRELATES OF NICOTINE DEPENDENCE AMONG MEN AND
WOMEN IN THE U.S. NAVAL SERVICES**

**Laurel L. Hourani, PhD, MPH
Huixing Yuan, PhD**

**Naval Health Research Center
Department of Epidemiology and Health Sciences
P.O. Box 85122
San Diego, CA 92186-5122**

and

**Robert M. Bray, PhD
Amy M. Vincus, MPH**

**Research Triangle Institute
P.O. Box 12194
Research Triangle Park, NC 27709-2194**

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Executive Summary

Background

Despite numerous smoking cessation studies, it is unknown what proportion of military smokers (men or women) may be addicted to nicotine or what psychosocial factors may be contributing to eventual nicotine dependence in this population. Knowledge of the prevalence and correlates of nicotine dependence is important to estimate the proportion of smokers who are most likely to benefit from dependence-based treatments and to assess their risks for associated morbidity. This study assessed the prevalence and psychosocial correlates of clinical criteria-based diagnoses of nicotine dependence in men and women in the U.S. naval services.

Approach

Analyses were based on data from the 1995 Perceptions of Wellness and Readiness (POWR) Assessment, a population-based self-report survey of 9,856 active-duty Navy and Marine Corps members worldwide, specifically focusing on a subsample of those who completed the telephone version of the Quick Diagnostic Interview Schedule ($n = 782$).

Results

Twenty-five percent of all respondents met diagnostic criteria for lifetime nicotine dependence, and 15% met criteria for nicotine dependence in the last year. There was no difference in nicotine dependence by traditional versus nontraditional job classification among women. Women who were abused prior to entering the military were almost 3 times as likely to be nicotine dependent as those not abused. Men who had been exposed to combat or violence were twice as likely to be nicotine dependent as those not exposed.

Conclusions

Nicotine dependence in the naval services may occur more as a result of its use as a toughening/strengthening type coping strategy for exposure to harmful physical situations, than as a relaxing, calming type coping strategy for job or life stress as suggested by stress-coping models of addiction.

Psychosocial Correlates of Nicotine Dependence Among Men and Women in the U.S. Naval Services

Like alcoholism, nicotine dependence is recognized as a serious drug addiction by the American Psychiatric Association in its Diagnostic Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R, 1987). It is usually related to cigarette smoking, and its diagnosis requires the presence of three of the following symptoms for at least one month: unsuccessful efforts to cut down or quit, using the drug to relieve withdrawal symptoms, tolerance, giving up important activities, withdrawal, and continued use despite knowing its adverse health effects.

Although the proportion of smokers in the American population has fallen from 41% to 26% since the 1960s, little is known about the prevalence of smokers who meet diagnostic criteria for dependence. Hughes, Gust, and Pechacek (1987) suggested that there may be an increase in the proportion of dependent smokers because those smokers who have quit are the less dependent smokers. Among 1,200 male and female members of a health maintenance organization (aged 21- to 30- years old), the lifetime prevalence of nicotine dependence was estimated at 20%, and the prevalence among persons who had ever initiated smoking was 27% (Andreski & Breslau, 1993; Breslau, Fenn, & Peterson, 1993). In a sample of 1,006 middle-aged male smokers, 90% fulfilled DSM-III criteria for nicotine dependence (Hughes et al., 1987). Similarly, Russell (1990) noted that among British adolescents who reported smoking at least one cigarette once a week for at least one month, approximately 90% progressed to dependence, and 75% of those who had ever experimented with cigarettes eventually escalated to regular smoking.

Cigarette smoking is of particular concern in military populations because it is even more prevalent than in civilian populations; military personnel are more likely to be heavy smokers (Bray, Marsden, & Peterson, 1991) and many begin smoking after they enter the service (Cronan & Conway, 1988; Conway, Cronan & Kaszas, 1989). Military women are especially likely to smoke and smoke heavily with rates similar to, and sometimes exceeding, those of military men. In contrast, civilian women have lower rates of both overall and heavy smoking (Bray et al., 1991). These data suggest that women entering the military's predominantly male social environment and/or occupations traditionally held by men (both combat related and non-combat related), may take on health behaviors and health risks that mirror those of their male counterparts. Increased smoking and its related nicotine dependence may be one of these risks (Ross & Bird, 1994).

Several theories have been offered to explain the intractability of cigarette smoking. The high proportion of smokers who become dependent is consistent with classical addiction theory, which places the responsibility for drug dependence on the drug itself, rather than on individual characteristics. However, alternative explanations have been suggested to account for the small but potentially important group of smokers, sometimes referred to as "chippers," who smoke very little on a regular basis without developing dependence (Shiffman, 1989; Kassel, Shiffman, Gyns, Paty, & Zettler-Segal, 1994). These studies of chippers have found that personality and psychosocial variables may differentiate them from regular smokers. Like any drug dependency, the price, availability, and social acceptability of the drug also influence nicotine addiction. The poor are more likely to smoke because they have "lower expectations of life, less sense of control over the future, less access to information, and less opportunity for treatment" (Grinspoon, p.2, 1997). Others at high risk for nicotine dependence are people with psychiatric disorders. In a

series of reports on nicotine dependence, Breslau, Kilbey, and Andreski (1991; 1992; 1993a; 1993b) found that persons with nicotine dependence had higher rates of major depression and anxiety disorders, as well as higher scores on measures of psychological vulnerability, including neuroticism, negative affect, and hopelessness. It was suggested that such psychological vulnerabilities might predispose an individual to both nicotine dependence and psychiatric disorder.

Some demographic and psychosocial variables have been examined as correlates of smoking in the Navy and other military populations. For example, cigarette pack years among military personnel have been found to be higher among males, whites, and those with less than a high school education (Bray, Marsden, Guess, & Herbold, 1989; Hurtado, Shappell, Bohnker, & Fraser, 1995). Navy male enlisted smokers were found to be less internal than nonsmokers, and experience more role conflict and family strain (Burr, 1984). Among female Army nurses, current smokers reported more job stress, job dissatisfaction, and less social support than either former smokers or those who had never smoked (Alexander & Beck, 1990). Kroutil, Bray, and Marsden (1994) found that enlisted men who reported higher levels of work-related stress were more likely to be smokers.

The proportion of military smokers (men or women) who may be addicted to nicotine or the factors that may be contributing to eventual nicotine dependence are unknown. Knowing the prevalence of nicotine dependence is important for estimating the need for smoking-cessation programs and determining the proportion of smokers who are most likely to attend the programs and benefit from dependence-based treatments for smoking (Hughes et al., 1987). Identifying the correlates of nicotine dependence should facilitate the targeting of interventions to specific military populations. The purpose of the present study was to examine the prevalence of nicotine

dependence in Navy and Marine Corps men and women, to examine its prevalence among enlisted, active-duty women in traditional and nontraditional job classifications, and to examine potential gender differences in psychosocial correlates of current nicotine addiction.

METHOD

Sample

The overall survey sample design was a two-stage probability sample, with Navy and Marine Corps installations selected at the first stage and personnel assigned to selected installations chosen at the second stage. In addition, stratification was used to further control the sample distribution with respect to sociodemographic characteristics, (i.e., branch of service, sex, race, and paygrade). Stratifying by continental United States and outside the continental United States controlled the geographic distribution of the sample.

From a targeted sample of almost 25,000 active-duty members, the total respondent sample for the POWR questionnaire survey consisted of 9,856 Navy and Marine Corps personnel selected from 45 geographic locations worldwide. The overall response rate for the questionnaire was 40%. Further details on the construction of the sample frame, its stratification, allocation procedures, weighting, and estimation procedures are available elsewhere (Hourani et al., 1996).

On a special handout that accompanied the questionnaire, all personnel were asked if they would be willing to participate in a confidential telephone interview regarding their health and mental health, and if so, to provide phone numbers and preferred contact times. The sample for the telephone interview component of the survey was selected from the portion of respondents to the questionnaire that consented to the telephone interview and provided usable phone numbers. This number was 3,591 of the questionnaire respondents. That is, 36% of the personnel who completed the questionnaire also volunteered for the telephone interview. Based on criteria for a

high level of psychosocial distress as determined by standardized cutoff scores on self-administered screening instruments included in the written questionnaire (Center for Epidemiologic Studies Depression Scale [CES-D] (Husaini, Neff, Harrington, Hughes, & Stone, 1980) and the short form of the Hopkins Symptom Checklist [Hopkins-21] (Deane, Leathem, & Spicer, 1992)), a third stage, weighted, stratified, sampling frame oversampled respondents who met criteria on the screening instruments. This sampling design was patterned after the approach for case identification and diagnosis described by Shrout, Spicer, & Fleiss (1987). Persons of greatest interest for this interview component were those who were most likely to have mental health diagnoses, including nicotine dependence. Sample sizes of those who did not meet criteria for psychosocial distress or could not be determined were based on an estimated 20% prevalence rate, 95% accuracy, and a 5% error rate. The final number of interviewed individuals was 782, which represented 3,591 when weighted to the interview volunteer population. The sample consisted of 325 men (weighted $n = 1,609$) and 457 women (weighted $n = 1,982$).

Measures

Nicotine dependence and tobacco use measures. 1. Nicotine dependence. The Quick Diagnostic Interview Schedule (QUICK DIS) (Robins, Marcus, & Bucholz, 1991) was the psychiatric diagnostic instrument used in this study. It is a shortened, computerized version of the Diagnostic Interview Schedule used previously in the well-known Epidemiological Catchment Area studies (Andreski & Breslau, 1993; Robins, Helzer, Ratcliff, & Seyfried, 1982; Robins, Locke & Regier, 1991) and is based on the DSM-III-R. The Quick DIS asks the minimum number of questions needed to make a diagnostic decision of lifetime and active (within the last year) nicotine dependence. A positive diagnosis for nicotine dependence included mild, moderate, and severe cases that met the above DSM-III-R criteria. Nicotine abuse

was not assessed, since the DSM-III-R manual states that such abuse is virtually never present without a history of dependence. Ninety-nine percent of the cases in the present study were addicted to cigarettes and only 1 percent addicted to other tobacco products. Test-retest correlations showed good agreement between interviews ($K = .74$). The Quick DIS also assessed DSM-III-R criteria for alcohol abuse or dependence with somewhat less test-retest reliability ($K = .46$). Criteria for both diagnoses are maintained in DSM IV.

2. Tobacco use. Tobacco use was assessed by items concerned with amount and frequency of smoking tobacco, use of smokeless tobacco, and quitting history. These items were adapted from the 1992 Worldwide Survey of Substance Abuse and Health Behaviors Among Military Personnel (Bray et al., 1992).

Psychosocial Measures. In addition to sociodemographic variables that included sex, age, race, education, branch of service, and job classification (traditional vs. nontraditional, as defined in Nice & Hilton, 1990), 16 psychosocial variables were assessed. These variables were broadly categorized into 5 classes related to: mental health, personality characteristics, psychosocial functioning, occupational stress, and perceived health.

1. Mental health. The 20-item CES-D assessed depressive symptomatology. Widely used in community samples, the 4-point scale assesses how often respondents "have felt this way during the past 7 days" (Husaini et al., 1980; Radloff, 1977) with responses ranging from rarely or none of the time (less than 1 day) to most or all of the time (5-7 days). Items are scored such that the higher the score, the more depressed the respondent. A score of 15 or greater is considered an indicator of depression in rural samples while a score of 16 indicates depression in urban samples (Husaini et al., 1980). Since our Navy sample consisted of personnel from both

rural and urban areas, the screening cutoff of 16 was considered conservative for this population and chosen to minimize the false positive rate.

Psychological distress was assessed with the Hopkins-21. This shortened version of the widely used Hopkins Symptom Checklist inquires how the respondent felt during the past 7 days using a 4-point scale ranging from not at all (0) to extremely (3). The total distress score has been found to have high internal consistency (split-half alpha coefficients of .90 and .89; Green, Walkey, McCormick, & Taylor, 1988). The 21 items were summed and averaged to obtain total distress scores such that the higher the score, the higher the distress. Normative data on 224 registered nurses found a mean total distress score of 35.56 ($SD = 8.52$) (Deane et al., 1992). Therefore a screening cutoff score of 37 was chosen to optimize desired test sensitivity and specificity.

2. Personality characteristics. Personality characteristics were assessed through anger, anxiety, and self-esteem scales. Trait anger was assessed with the Trait anger scale from Spielberger's State-Trait Anger Expression Inventory. This scale measures individual differences in the disposition to experience anger (Spielberger, 1979). The 4-point scale ranges from almost never (1) to almost always (4) and yields a range of scores from 10 to 40.

Trait anxiety was evaluated by the 20-trait items of the Spielberger State-Trait Anxiety Inventory [STAI](Spielberger, 1977). The 4-point scale inquiring about how respondents "generally feel," with responses ranging from almost never (1) to almost always (4), yielded a range of scores from 20 - 80. The STAI is a widely used measure of relatively stable individual differences in anxiety-proneness, and it reflects the frequency and intensity with which anxiety states have been manifested in the past and the probability that state anxiety will be experienced in the future (Spielberger, 1977). Test-retest correlations for college students have ranged from

.73 - .86, and a high internal consistency reliability coefficient ($\alpha = .93$) was obtained in a sample of working adult males (Spielberger et al., 1970).

Global self-esteem was assessed with the Rosenberg Self-Esteem Scale. This 10-item instrument consisting of statements such as "I am able to do things as well as others" and "I take a positive attitude towards myself" was shown to have good internal consistency ($r = 0.78$) and significant negative correlations with depression measures (Westaway & Wolmarans, 1992). Its 4-point response scale ranges from strongly agree to strongly disagree and yields a range of scores from 10 (lowest self-esteem) to 40 (highest self-esteem).

3. Psychosocial functioning. Psychosocial functioning was assessed through quality of life, life events, history of abuse, stress and coping, exposure to disaster or violence, social support, and marital relations scales. Perceived quality of life was assessed, with four items adapted from Andrews and Withey (1976), on 5-point scales: one global item inquiring how respondents felt about their "life as a whole" and three items inquiring how they felt about their job, themselves, and their personal life. These items represent the four life domains as presented in Caplan, et al. (1984) and Woodruff and Conway (1990), and they have been shown to have a good internal consistency with an alpha of .81 (Conway, Trent, & Conway, 1989). Response options range from terrible/unhappy (0) to pleased/delighted (4). This measure has been used in several previous Navy samples (Conway, Trent, & Conway, 1989; Woodruff & Conway, 1990; Woodruff & Conway, 1992) and provides a single summary score.

Life events were assessed with an item taken from the U.S. Army's Fit to Win Health Risk Appraisal (DA Form 5675) that inquired how many serious personnel losses or difficult problems the respondent had to handle in the last year. The 4-point response scale ranged from none (0) to several (3).

History of abuse was assessed with the sum of six items specifically developed for this survey: three items inquiring whether the respondent had been abused (emotionally, sexually, or physically) prior to entering the military and three items inquiring whether the respondent had been abused (emotionally, sexually, or physically) since entering the military.

Stress and coping were assessed using four items developed at the Department of Military Psychiatry at the Walter Reed Army Institute of Research and modified for this Navy sample. Three of the four items inquired how much stress had affected the respondent's job performance, personal life, and life as a whole, over the past 7 days, and they were scored on a 5-point scale from none at all (0) to an extreme amount (4). A fourth item inquired how well the respondent coped with stress over the past 7 days and was scored on a 5-point scale from very poorly (0) to very well (4).

Exposure to disaster or violence was assessed by an item specifically developed for this study. Respondents were queried whether they had ever been exposed to combat or other violence involving injuries or fatalities and if so, as a witness, survivor/victim, part of military job, or participant in aid, cleanup, rescue, or investigation. The sum of these four types of experiences indicated degree of exposure.

Social support was assessed with a modified version of the Social Network Index (Berkman, 1977; Berkman & Syme, 1979; Strawbridge, 1995). This index was developed by the Human Population Laboratory and has been used to predict a number of health outcomes. It also has been used in several previous Navy samples (Conway, Trent & Conway, 1989). The standard scoring protocol for the index was followed in which scores from an index of intimate ties are combined with an organizational membership score and a church membership score to form the Social Network Index.

Marital relations measures were taken from a restructured version of the Social Adjustment Scale-II (SAS-II) (Schooler, Hogarty, & Weissman, 1974). The marital conflict measure was derived from factor analyses conducted on studies of blue-collar workers (Parkinson & Bromet, 1983; Parkinson, Ryan Bromet, & Connel, 1986) and it averaged the sum of two items dealing with help-seeking for marital problems and one item on time spent thinking about marital problems (1 = never, 5 = very often). This measure was supplemented with a single-item measure of marital satisfaction taken from the Marital Satisfaction Scale (Roach, Frazier, & Bowden, 1981). This single item had the highest correlation ($r = .79$) with the whole score of the original 73-item scale and was included as a balance to the negative wording of the marital conflict scale of the SAS-II.

4. Occupational stress. Occupational stress was assessed through job pressures and job satisfaction scales. Perceived job pressures were assessed with the 12-item Job Pressures Scale constructed by James House in his research with factory workers (House, 1980). On the basis of principal component analysis, these items could be clustered into four indices reflecting job versus nonjob conflict, role conflict, quality concern, and responsibility. Respondents were asked to indicate how often they were "bothered" by pressure or stresses on a 5-point scale ranging from not at all (0) to nearly all of the time (4). Overall and subscale scores were obtained by summing and averaging the raw scores (House, Wells, Landerman, McMichael, & Kaplan, 1979).

General job satisfaction was assessed through four items from Quinn and Shepherd (1974) and from an occupational self-esteem item to form the Job Satisfaction Index adopted by House (1980). Two items concerning the level of satisfaction and happiness with the job, two items concerning the respondent's readiness to make the same decision now to take the job

and/or recommend it to a good friend, and one item concerning whether the job measures up to prior expectations were reworded to indicate the respondent's military job. These items were then averaged to create a measure of military job satisfaction. Scores could range from 0 (low satisfaction) to 10 (high satisfaction). This scale was found to have relatively high internal reliability ($\alpha = .79$) among a sample of nuclear power plant workers (Parkinson & Bromet, 1983).

5. Perceived health. Perceived health status was assessed through the general health perception scale from the Rand 36-Item Health Survey (Version 1.0) adapted from the Medical Outcomes Study (MOS) (Ware & Sherbourne, 1992). The MOS scales have been found to have reliability (α) coefficients ranging from .76 to .88 and have scores ranging from 0 to 100, with 100 representing optimal health status (Stewart, Hayes, & Ware, 1988).

Data Collection Procedures

All psychosocial data were collected from responses to three waves of a self-report mail questionnaire. Personal identifiers were requested on the questionnaire to link respondents' data to their telephone survey data. These personal identifiers were stripped from the database upon merging of the data sets to preserve confidentiality.

Sampled volunteers were contacted by telephone to schedule their interview. Although 30 interviews were conducted face-to-face following a small group on-site administration of the questionnaire, most interviews were conducted by telephone in private offices. A minimum of six attempts to contact a selected individual was made at various times during day and evening hours. Once contact was made, individuals were reminded of their earlier consent to an interview, informed that it would take 15 - 45 minutes, and asked if it was a good time to complete the survey. Any questions they had, usually pertaining to anonymity and privacy, were

also answered. Individuals were assured that no military personnel would have access to an individual's interview results nor would any aspect of the interview be made part of his/her Navy record. They were informed that most of the questions could be answered with a "yes" or "no". Call-back appointments were made as needed and recorded on a call-back log. The average interview length was 26 min. To examine test-retest reliability, interviewers readministered the Quick DIS to a random sample of each other's previous interviewees. Completed interviews were scored by computer software, thus ensuring the anonymity of final results.

Statistical Analyses

The results presented in all tables have been weighted to account for sample selection probabilities using SUDAAN (SURvey DATA ANalysis), a program developed by Research Triangle Institute, Research Triangle Park, NC, for the specific purpose of analyzing data from complex sample surveys (Shah, Barnwell, Bieler, 1996). SUDAAN permits the use of stratified data to obtain estimates using the proper design parameters, and it computes the appropriate standard errors of these estimates. Prevalence estimates by demographics and service presented in Table 1 were calculated using the Crosstab Procedure in the SAS-callable version. Means for psychosocial variables and multiple logistic regression model parameters were obtained using DESCRIPT and LOGIST procedures, respectively.

RESULTS

Chi-square tests evaluated the concurrence of smoking habits of telephone interview volunteers with the questionnaire respondents. There were no differences between volunteers and questionnaire respondents in the proportion of lifetime or current smokers in either group. Table 1 shows the prevalence of nicotine dependence among Navy and Marine Corps respondents by demographic and service characteristics. Fifteen percent of the sample had been

addicted to nicotine in the past year, and 25% had been dependent at some time in their life. This is in comparison with 34% who reported smoking at least one cigarette in the last month and 27% who consider themselves current smokers. There were no differences in one year or lifetime prevalence rates between men or women or by age group, although the number of women in the over 45 year old age group was small. Whites were significantly more likely to be nicotine dependent than other ethnic groups. Current nicotine dependence was almost twice as prevalent among respondents with only a high school education compared with those who had some college education. When prevalence among enlisted women only was examined by job classification, no differences in nicotine dependence were found between traditional occupations (administrative, clerical, medical, dental) and nontraditional occupations (all other, including seaman, fireman, aviator, engineer, construction).

The co-occurrence of alcohol abuse or dependence was also examined in nicotine dependent and nondependent respondents (data not shown). Among all respondents with a lifetime diagnosis of nicotine dependence, 30% had a lifetime diagnosis of alcohol abuse or dependence. In comparison only 10% of the non-nicotine-dependent respondents ($X^2_1 = 20.10, p < .0001$) had such a diagnosis. Among women respondents with a lifetime diagnosis of nicotine dependence, 21% also had a lifetime diagnosis of alcohol abuse or dependence compared with 6% of the women without nicotine dependence ($X^2_1 = 7.38, p = .0067$). Among men, 39% of those who had been addicted to nicotine at some time in their life, had also been abusing or dependent on alcohol. In comparison, only 15% of the non-nicotine-dependent men ($X^2_1 = 11.19, p = .0009$) had abused or depended on alcohol. Although there were very few cases of current (1-year) alcohol abuse/dependence in this sample, the general pattern that nicotine-dependent

personnel were more likely to be alcohol abuse/dependent than non-nicotine-dependent personnel held among current cases.

The psychosocial correlates of lifetime nicotine dependence (including 71 former smokers) and current nicotine dependence by gender are presented in Tables 2 and 3. Only 1 of the 16 psychosocial variables, trait anger, was associated with a lifetime diagnosis of nicotine dependence among men. Among women, lifetime nicotine dependence was associated with lower quality of life ratings, higher life stress and job stress scores, a history of abuse, greater marital conflict, and poorer perceived health. An overall association with casualty exposure for men and women existed when combined, but not when separated.

In contrast to the few psychosocial correlates of a lifetime diagnosis, 12 psychosocial variables were found to have an overall association with a diagnosis of current nicotine dependence; 9 of which were associated with men and women separately. Those variables associated with both sexes included higher trait anger scores, lower quality of life, greater life stress and job stress, and poorer perceived general health. Only among men were greater depression, psychological distress, more casualty exposure, and less perceived social support associated with nicotine dependence; whereas among women only, trait anxiety, marital conflict, marital dissatisfaction, and history of abuse were correlates of current nicotine dependence. Life events, job satisfaction, and self-esteem were not associated with nicotine dependence for men or women, although life events did have an overall association.

To determine the most important correlates of current nicotine dependence, separate backward stepwise logistic models were computed for men and women. All variables that were significant at the univariate level were considered for initial entry into the models. Where two variables were correlated at .55 or more, only the stronger of the two (or the one with the more

reliable scale) was retained to avoid multicollinearity problems. The final models are shown in Tables 4 and 5. Among women, the main psychosocial correlates of nicotine dependence were a history of abuse prior to entering the military and greater job stress. Ethnicity and education were treated as covariates. Adjusted odds ratios indicated that women who were abused prior to entering the military were 3 times as likely to be smokers than those not abused. Among men, the main psychosocial correlates of nicotine dependence were being exposed to combat or violence and having more trait anger. Odds ratios, adjusted for ethnicity, education, and trait anger, indicated that men who were exposed to combat or violence were twice as likely to be smokers compared with men who did not report such exposure.

DISCUSSION

This exploratory study found that while the prevalence of nicotine dependence was similar among male and female naval service respondents, men and women varied with respect to the psychosocial variables that best predicted the addiction. Although job stress was shown to be an important correlate of nicotine dependence among women, there was no difference in dependence whether the job was classified as traditional or nontraditional. This finding suggests that naval service women's health and health behaviors may be more vulnerable to job stress regardless of job classification than that of their male counterparts. This is an unexpected result because a recent study of women and alcohol found that women who work in male-dominated careers - such as construction or airline piloting - drink more than those who are teachers, nurses, or librarians (Wilsnack, 1998). On the other hand, that study also found that women who have multiple roles - such as wife, mother, and employee - are less likely to have drinking problems than women who have fewer roles. It may be that the multiple roles of a typical military woman, may help to ameliorate the effect of working in a traditionally male occupation. It is of interest

that the main psychosocial predictor of nicotine dependence among both men and women in this sample involved exposure to harmful physical situations: a history of sexual or physical abuse for women, and exposure to combat or violence involving casualties for men. The greater overall life stress, poorer quality of life, poorer interpersonal relations (i.e., less social support, higher marital conflict scores) and poorer emotional well being that were associated with nicotine dependence at the univariate level were accounted for by these experiences in the multivariate models. Although such experiences are presumably stress-producing, the finding that it is something about the experience itself rather than the level of perceived stress, that is associated with nicotine dependence, may account for the inconsistent and generally weak support previous studies have garnered for a stress-coping model of addiction (Kassel et al., 1994; Shiffman, 1989). It is feasible, for example, that individuals who have been exposed to abuse and violence may relate more to cigarette marketing strategies that promote the image of a smoker as a tough, strong, independent "Marlboro man" type than individuals who have not had the same exposures. It may be such an internalized image that is used as a coping strategy and increases the likelihood of regular smoking that is associated with nicotine dependence. Such an image may be particularly relevant to a younger military population. Nicotine dependence in the naval services may thus occur more as a result of its use as a toughening/strengthening effort to cope with exposure to harmful physical situations, than as a relaxing, calming effort to cope with job or life stress as suggested by stress-coping models of addiction. Such abuse and violence exposures may also provide a common link between nicotine dependence and vulnerability to psychopathology (Breslau et al., 1993a, 1993b). This notion is supported with the high level of co-occurrence observed between nicotine dependence and alcohol abuse/dependence. Future intervention research may target these apparent high-risk groups.

This study is the first to report prevalence estimates of nicotine dependence, as distinct from smoking, in a military population, and it supports previous findings of a higher lifetime prevalence of nicotine dependence in whites than in blacks among the general population (Andreski & Breslau, 1993; Husten, McCarty, Giovino, Chrismon, & Zhu, 1998). The 20% lifetime prevalence among men and women under age 30 in the present sample is consistent with the 20% lifetime prevalence found among adults ages 21-30 in a general population sample using the DIS and DSM-III-R criteria (Andreski & Breslau, 1993; Breslau et al., 1993). Higher lifetime rates for older women and much higher lifetime rates for older men but lower 1-year rates for older respondents are consistent with recent studies that found decreases in the prevalence of smoking in the military (Bray et al., 1995; Trent & Hurtado, 1997) and suggest a concomitant decrease in nicotine dependence. Follow-up studies will be able to assess the extent to which this decrease reflects the relative proportion of smokers who are nicotine dependent. Similar to previous studies of cigarette smoking in the military (Bray et al., 1995; Cronan & Conway, 1988), the present study also found higher rates of nicotine dependence among the less educated and those in lower paygrades. Further, results are consistent with a previous study of young adults in a general population sample that showed persons with nicotine dependence reported poorer health than nondependent smokers and never smokers (Andreski & Breslau, 1993). That study showed that it was nicotine dependence, rather than smoking per se, that was significantly associated with increased odds for health problems, suggesting that nicotine dependence, in addition to smoking, should be a primary concern for military readiness.

One study has suggested that DSM-III-R criteria for tobacco dependence may be overinclusive (Hughes, et al., 1987); however, unlike the present study or others that obtained similar prevalence rates, that study did not use the DIS to make the diagnosis. The consistency

across studies and the high test-retest correlation suggest that the Quick DIS was a reliable measure of nicotine dependence. However, the volunteer nature of the sample, a typical but low response rate to the mail questionnaire, and the self-report nature of the psychosocial measures limit the results of this study and caution against its generalizability. Also, despite a more comprehensive inclusion of psychosocial predictors than previous studies of psychosocial correlates of smoking, only a small amount of the variance was explained by these variables. Future studies of nicotine dependence should include additional predictors such as age at first cigarette, as well as timing of physically harmful exposures, in prospective designs that can track the development of smoking a first cigarette to full-blown dependence. Navy and other military populations who begin to smoke after entering the service present the opportunity to intervene before dependence occurs.

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Requests for reprints should be sent to Laurel Hourani, Naval Health Research Center, Division of Health Sciences, P.O. Box 85122, San Diego, CA 92186-5122.

Table 1

Nicotine Dependence Among Navy and Marine Corps Telephone Interview Volunteers by Demographics and Service, 1995-1996

	Prevalence in Percent (Standard Error)		
	One-year	Lifetime	Remission% ^a
	(unweighted N = 147)	(unweighted N = 218)	
Total	14.57 (1.58)	25.00 (2.02)	42
Sex and age			
Women	13.95 (2.13)	21.90 (2.58)	36
18-29	12.80 (2.83)	20.51 (3.54)	38
30-44	15.68 (3.42)	22.55 (3.90)	30
45-64	10.41 (7.72)	27.51 (11.77)	62
Men	15.33 (2.37)	28.82 (3.19)	47
18-29	17.08 (4.25)	20.49 (4.59)	17
30-44	14.53 (3.02)	30.57 (4.26)	52
45-64	13.88 (8.50)	52.01 (13.68)	73
Race			
White	17.96 (2.04)*	30.49 (2.54)*	41
All others	5.69 (1.86)	10.64 (2.69)	46
Education			
High school only	19.47 (2.95)**	28.06 (3.38)	31
Any college	11.64 (1.78)	23.17 (2.51)	50
Service			
Navy	14.00 (1.63)	25.16 (2.14)	44
Marine Corps	19.54 (5.72)	23.62 (2.51)	17
Enlisted women job Classification			
Traditional	17.34 (3.94)	24.00 (4.49)	28
Nontraditional	15.52 (3.24)	23.58 (3.83)	34
Paygrade			
E1-E6	16.90 (2.08)*	27.18 (2.28)**	38
E7 + ^b	10.25 (2.31)	15.33 (4.12)	33

^aLifetime prevalence (LT) minus one-year prevalence (1 yr) divided by LT: (LT - 1 yr)/LT.

^bIncludes senior enlisted and officers due to small number of smoking officers.

* $p \leq .0001$.

** $p = .02$.

Table 2

Psychosocial Functioning in Lifetime Nicotine Dependent and Nondependent Navy and Marine Corps Telephone Interview Volunteers, 1995-1996

	Nicotine dependent Mean (SE)	Nondependent Mean (SE)	Total Mean (SE)	Test statistic T test/P value
Depression ^a	10.59 (0.71)	9.49 (0.38)	9.78 (0.34)	1.37, .170
Women	11.82 (1.06)	10.71 (0.56)	10.95 (0.50)	0.93, .355
Men	9.55 (0.93)	7.85 (0.48)	8.37 (0.50)	1.63, .103
Psych distress ^b	31.63 (0.57)	30.50 (0.34)	30.79 (0.29)	1.70, .089
Women	31.96 (0.80)	31.16 (0.48)	31.34 (0.41)	0.86, .392
Men	31.32 (0.80)	29.59 (0.48)	30.10 (0.41)	1.86, .063
Anger ^c	18.63 (0.48)	17.38 (0.24)	17.70 (0.22)	2.32, .021
Women	18.99 (0.73)	17.76 (0.32)	18.04 (0.30)	1.54, .123
Men	18.28 (0.62)	16.87 (0.36)	17.29 (0.31)	1.97, .050
Anxiety ^d	36.50 (0.75)	34.98 (0.49)	35.38 (0.41)	1.70, .090
Women	37.80 (1.15)	36.01 (0.66)	36.42 (0.57)	1.34, .180
Men	35.28 (0.94)	33.57 (0.70)	34.08 (0.57)	1.45, .147
Self esteem ^e	1.70 (0.10)	1.79 (0.10)	1.77 (0.08)	-0.62, .533
Women	1.89 (0.19)	1.74 (0.09)	1.78 (0.08)	0.69, .487
Men	1.52 (0.08)	1.85 (0.21)	1.75 (0.15)	1.49, .136
QOL ^f	10.87 (0.25)	11.64 (0.13)	11.45 (0.12)	-2.77, .006
Women	10.44 (0.34)	11.38 (0.19)	11.17 (0.16)	-2.45, .014
Men	11.27 (0.34)	12.00 (0.18)	11.79 (0.16)	-1.88, .060
Life stress ^g	5.76 (0.22)	5.05 (0.15)	5.23 (0.13)	2.72, .007
Women	6.21 (0.29)	5.23 (0.20)	5.44 (0.17)	2.81, .005
Men	5.34 (0.30)	4.80 (0.23)	4.96 (0.19)	1.42, .157
Job stress ^h	18.55 (0.8)	16.26 (0.49)	16.83 (0.43)	2.32, .021
Women	19.15 (1.13)	15.96 (0.65)	16.65 (0.57)	2.46, .014
Men	17.98 (1.26)	16.69 (0.73)	17.06 (0.64)	0.88, .378

^aCES-D; scores of 16 or more indicate depression (Housaini et al., 1980).^bHopkins-21; scores of 37 or more indicate psychological distress (Deane et al., 1992).^cSpielberger T-Anger Scale (Spielberger, 1979).^dSpielberger Trait Anxiety Inventory (Spielberger, 1977).^eRosenberg scale; lower scores indicate higher self-esteem (Westaway & Walmarans, 1992).^fQuality of Life scale (Andrews & Withey, 1976); lower scores indicate lower quality of life.^gStress scale (Army); higher scores indicate higher stress.^hJob stress scale (House, 1980); higher scores indicate higher stress.

Table 2 (Cont'd)

Psychosocial Functioning in Lifetime Nicotine Dependent and Nondependent Navy and Marine Corps Telephone Interview Volunteers, 1995-1996

	Nicotine dependent Mean (SE)	Nondependent Mean (SE)	Total Mean (SE)	Test statistic T test/P value
Job satisfaction ⁱ	5.70 (0.26)	6.03 (0.16)	5.95 (0.14)	-1.08; .279
Women	5.93 (0.37)	5.90 (0.20)	5.91 (0.18)	0.05; .960
Men	5.48 (0.37)	6.20 (0.25)	6.00 (0.21)	1.61; .108
Casualty exposure ^j	1.67 (0.18)	1.16 (0.07)	1.29 (0.07)	2.66; .008
Women	1.23 (0.21)	0.86 (0.07)	0.94 (0.07)	1.72; .086
Men	2.09 (0.28)	1.57 (0.13)	1.72 (0.12)	1.69; .092
Social support ^k	3.85 (0.27)	4.16 (0.15)	4.08 (0.13)	-1.01; .311
Women	3.31 (0.37)	3.71 (0.18)	3.62 (0.17)	-0.97; .334
Men	4.34 (0.38)	4.79 (0.25)	4.66 (0.21)	-1.01; .315
Marital conflict ^l	1.96 (0.07)	1.86 (0.05)	1.89 (0.04)	1.11; .268
Women	2.16 (0.12)	1.86 (0.07)	1.93 (0.06)	2.12; .034
Men	1.81 (0.08)	1.86 (0.07)	1.85 (0.05)	-0.51; .611
Marital satisfaction ^m	3.86 (0.13)	4.11 (0.08)	4.04 (0.07)	-1.65; .099
Women	3.76 (0.22)	4.10 (0.11)	4.02 (0.10)	-1.35; .177
Men	3.94 (0.15)	4.12 (0.10)	4.07 (0.08)	-1.04; .300
History of abuse ⁿ	0.94 (0.11)	0.65 (0.05)	0.72 (0.05)	2.51; .012
Women	1.51 (0.18)	0.85 (0.07)	1.00 (0.07)	3.45; .001
Men	0.42 (0.08)	0.37 (0.07)	0.38 (0.05)	0.49; .626
Life events score ^o	1.26 (0.09)	1.09 (0.05)	1.13 (0.05)	1.59; .112
Women	1.31 (0.12)	1.08 (0.07)	1.13 (0.06)	1.57; .117
Men	1.21 (0.13)	1.10 (0.08)	1.13 (0.07)	0.72; .473
Perceived general health ^p	72.01 (1.72)	76.34 (0.96)	75.24 (0.84)	-2.20; .028
Women	68.75 (2.67)	74.71 (1.22)	73.38 (1.13)	-2.03; .043
Men	75.08 (2.06)	78.55 (1.51)	77.53 (1.22)	-1.36; .175

ⁱQuinn & Shephard (1974), House (1980); higher scores indicate higher job satisfaction.

^jNumber of times exposed to casualty-related event; higher score indicates greater exposure.

^kSocial Network Index (Berkman, 1977); higher scores indicate greater social support.

^lAdapted from SAS-II (Parkinson & Bromet, 1983); higher scores indicate greater conflict.

^mMSS (Roach et al., 1981); higher scores indicate greater satisfaction.

ⁿSummary scale of emotional, sexual, and physical abuse; higher scores indicate greater abuse.

^oFour-item scale adapted from Army's Fit to Win HRA; higher scores indicate more negative life events.

^pScale from MOS (Ware & Sherbourne, 1992); higher scores indicate more positively perceived general health.

Table 3

Psychosocial Functioning in Current Nicotine Dependent and Nondependent Navy and Marine Corps Telephone Interview Volunteers, 1995-1996

	Nicotine dependent Mean (SE)	Nondependent Mean (SE)	Total Mean (SE)	Test statistic T test/P value
Depression ^a	12.67 (0.99)	9.26 (0.36)	9.78 (0.34)	3.23; .001
Women	12.84 (1.38)	10.63 (0.53)	10.95 (0.50)	1.49; .136
Men	12.48 (1.42)	7.59 (0.44)	8.37 (0.44)	3.29; .001
Psych distress ^b	32.99 (0.77)	30.41 (0.32)	30.79 (0.29)	3.11; .002
Women	32.96 (1.04)	31.08 (0.44)	31.34 (0.41)	1.66; .098
Men	33.02 (1.13)	29.56 (0.44)	30.10 (0.41)	2.85; .004
Anger ^c	19.68 (0.68)	17.35 (0.22)	17.70 (0.22)	3.23; .001
Women	19.84 (1.01)	17.73 (0.30)	18.04 (0.30)	2.00; .045
Men	19.50 (0.91)	16.88 (0.32)	17.29 (0.31)	2.72; .007
Anxiety ^d	38.43 (1.05)	34.83 (0.44)	35.38 (0.41)	3.16; .002
Women	40.08 (1.43)	35.78 (0.62)	36.42 (0.57)	2.76; .006
Men	36.46 (1.42)	33.65 (0.62)	34.08 (0.57)	1.82; .070
Self esteem ^e	1.70 (0.07)	1.78 (0.09)	1.77 (0.08)	-0.67; .505
Women	1.82 (0.07)	1.77 (0.10)	1.78 (0.08)	0.44; .659
Men	1.56 (0.11)	1.79 (0.17)	1.75 (0.15)	-1.10; .271
QOL ^f	10.13 (0.31)	11.67 (0.12)	11.45 (0.12)	-4.55; .000
Women	10.01 (0.44)	11.36 (0.17)	11.17 (0.16)	-2.85; .004
Men	10.27 (0.45)	12.07 (0.17)	11.79 (0.16)	-3.74; .002
Life stress ^g	6.31 (0.26)	5.04 (0.14)	5.23 (0.13)	4.29; .000
Women	6.69 (0.34)	5.24 (0.19)	5.44 (0.17)	3.74; .000
Men	5.89 (0.39)	4.78 (0.21)	4.96 (0.19)	2.54; .011
Job stress ^h	20.39 (1.04)	16.21 (0.46)	16.83 (0.43)	3.68; .000
Women	20.66 (1.40)	15.99 (0.61)	16.65 (0.57)	3.06; .002
Men	20.07 (1.54)	16.50 (0.69)	17.06 (0.64)	2.12; .034

^aCES-D; scores of 16 or more indicate depression (Housaini et al., 1980).

^bHopkins-21; scores of 37 or more indicate psychological distress (Deane et al., 1992).

^cSpielberger T-Anger Scale (Spielberger, 1979).

^dSpielberger Trait Anxiety Inventory (Spielberger, 1977).

^eRosenberg scale; lower scores indicate higher self-esteem (Westaway & Walmarans, 1992).

^fQuality of Life scale (Andrews & Withey, 1976); lower scores indicate lower quality of life.

^gStress scale (Army); higher scores indicate higher stress.

^hJob stress scale (House, 1980); higher scores indicate higher stress.

Table 3 (Cont'd)

Psychosocial Functioning in Current Nicotine Dependent and Nondependent Navy and Marine Corps Telephone Interview Volunteers, 1995-1996

	Nicotine dependent Mean (SE)	Nondependent Mean (SE)	Total Mean (SE)	Test statistic T test/P value
Job satisfaction ⁱ	5.48 (0.33)	6.03 (0.15)	5.95 (0.14)	-1.49; .136
Women	5.73 (0.44)	5.94 (0.20)	5.91 (0.18)	-0.42; .672
Men	5.19 (0.51)	6.14 (0.23)	6.00 (0.21)	-1.71; .088
Casualty exposure ^j	1.59 (0.23)	1.24 (0.07)	1.29 (0.07)	1.48; .138
Women	0.86 (0.17)	0.95 (0.08)	0.94 (0.07)	-0.51; .612
Men	2.42 (0.38)	1.59 (0.12)	1.72 (0.12)	2.04; .042
Social support ^k	3.26 (0.31)	4.22 (0.14)	4.08 (0.13)	-2.79; .006
Women	2.79 (0.47)	3.76 (0.17)	3.62 (0.17)	-1.92; .056
Men	3.78 (0.39)	4.82 (0.23)	4.66 (0.21)	-2.27; .023
Marital conflict ^l	2.13 (0.10)	1.85 (0.04)	1.89 (0.04)	2.54; .011
Women	2.40 (0.18)	1.86 (0.07)	1.93 (0.06)	2.79; .005
Men	1.93 (0.09)	1.83 (0.06)	1.85 (0.05)	0.94; .347
Marital satisfaction ^m	3.61 (0.17)	4.12 (0.07)	4.04 (0.07)	-2.73; .007
Women	3.33 (0.32)	4.11 (0.10)	4.02 (0.10)	-2.32; .021
Men	3.80 (0.18)	4.12 (0.09)	4.07 (0.08)	-1.62; .106
History of abuse ⁿ	1.02 (0.14)	0.67 (0.05)	0.72 (0.05)	2.36; .018
Women	1.44 (0.22)	0.92 (0.07)	1.00 (0.07)	2.19; .029
Men	0.55 (0.11)	0.35 (0.06)	0.38 (0.05)	1.53; .128
Life events score ^o	1.35 (0.12)	1.09 (0.05)	1.13 (0.05)	1.98; .048
Women	1.31 (0.15)	1.10 (0.07)	1.13 (0.06)	1.26; .210
Men	1.40 (0.19)	1.08 (0.07)	1.13 (0.07)	1.54; .124
Perceived general health ^p	68.46 (1.89)	76.42 (0.92)	75.24 (0.84)	-3.78; .000
Women	67.59 (2.75)	74.34 (1.23)	73.38 (1.13)	-2.24; .025
Men	69.45 (2.54)	79.02 (1.36)	77.53 (1.22)	-3.32; .001

ⁱQuinn & Shephard (1974), House (1980); higher scores indicate higher job satisfaction.

^jNumber of times exposed to casualty-related event; higher score indicates greater exposure.

^kSocial Network Index (Berkman, 1977); higher scores indicate greater social support.

^lAdapted from SAS-II (Parkinson & Bromet, 1983); higher scores indicate greater conflict.

^mMSS (Roach et al., 1981); higher scores indicate greater satisfaction.

ⁿSummary scale of emotional, sexual, and physical abuse; higher scores indicate greater abuse.

^oFour-item scale adapted from Army's Fit to Win HRA; higher scores indicate more negative life events.

^pScale from MOS (Ware & Sherbourne, 1992); higher scores indicate more positively perceived general health.

Table 4

Multiple Logistic Regression Model^a of Demographic and Psychosocial Predictors of Nicotine Dependence in Past Year Among Navy and Marine Corps Women, 1995-1996

Variable	Odds ratio	95% CI ^b
Ethnicity		
White vs. other	5.35	1.72 – 16.64
Education		
High school vs. beyond		
high school	2.49	1.15 – 5.40
Job stress ^c	1.06	1.02 – 1.10
Sexual/physical abuse ^d		
Prior to service vs. no prior abuse	2.86	1.35 – 6.03

^aR² = .11.

^b95% confidence interval of the odds ratio.

^cRate of change for job stress score increase per unit.

^dTo more fully describe the history of abuse, individual items that created the scale were examined at the univariate level. This showed that only physical and sexual abuse prior to entering the military were associated with dependence. Therefore, a categorical variable was substituted (any prior physical or sexual abuse vs. no prior abuse) in the multivariate model.

Table 5

Final Multiple Logistic Regression Model^a of Demographic and Psychosocial Predictors of Nicotine Dependence in Past Year Among Navy and Marine Corps Men, 1995-1996

Variable	Odds ratio	95% CI ^b
Ethnicity		
White vs. other	3.05	1.04 – 9.00
Education		
High school vs. beyond high school	1.84	0.82 – 4.13
Exposure to combat or violence ^c		
Any exposure vs. no exposure	2.37	1.10 – 5.10
Trait Anger ^d	1.10	1.02 – 1.18

^a $R^2 = .09$.

^b95% confidence interval of the odds ratio.

^cIndividual items were collapsed to form the categorical variable.

^dRate of change for Trait Anger increases per unit.

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